

NATIONAL ACADEMY OF SCIENCES

LUDVIG HEKTOEN

1863—1951

A Biographical Memoir by

PAUL R. CANNON

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Biographical Memoir

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The principles which guided the scientific life of Ludvig Hektoen over an active professional career of more than sixty years are clearly pointed out in a paper published by him in 1904. This was shortly after he had become Head of the Department of Pathology of the University of Chicago and Director of the John McCormick Institute for Infectious Diseases. In that paper Hektoen suggested that, inasmuch as pathology is, in fact, pathologic biology, it should be studied as a part of general biology, with no particular reference to its practical applications. Moreover, he suggested that "there are other modes of progress toward knowledge of cellular activity and biologic mechanisms under pathologic as well as normal conditions than the purely morphologic highway." Thus, "in certain fields, at least, the student of the pure science of disease is primarily interested in the knowledge of disease for its own sake without much thought or immediate care as to any prompt, practical use to which such additions as he may make to this knowledge may be put. It is true here, as it is in general, that most things are done only on account of the results expected from them in the future, but immediate technical utility is not always the sole guiding principle of the investigator in pathologic domains. The history of pathology shows him that in this science, as well as in its synthetic sciences, all actual increase in knowledge eventually helps to relieve suffering."

Almost four decades later, in an evaluation of his career, Dr. James P. Simonds remarked that when Dr. Hektoen entered pathology "its intellectual atmosphere was already becoming sultry and oppressive with the stagnant air of decadence and ineffectiveness. Most of the contributions to pathologic anatomy had become trivial because they were merely repetitions and added little that was either fundamental or new." In short, the pathology of those days had to await developments in the fields of physiology and biochemistry before it would become possible

to interpret structural changes induced in the body by disease in relation to mechanisms of disease. As Simonds further said, Hektoen's mind was too active and too incorrigibly speculative to be content with descriptive methods alone. It was inevitable, therefore, that he should take the dynamic approach to the problems of infection and immunity, and "by so doing he was able to make the numerous useful and practical as well as the fundamentally scientific contributions to medicine."

Many of these contributions are now themselves a part of the history of medicine for which Hektoen himself had such a great respect. While making them he also helped by precept and example to establish traditions in pathology which will serve as guides to other pathologists in the years to come. Throughout his long and active life Dr. Hektoen demonstrated the cumulative value of such attributes as persistence, sustained industry, the intelligent application of simple methods to specific problems, a meticulous devotion to duty and a life-long enthusiasm for his chosen fields of interest. Because of these and other qualities his contributions to the history and traditions of pathology and medicine will long command the emulation and respect which they so well deserve.

School and College

Ludvig Hektoen was born in Westby, Wisconsin, on July 2, 1863, the son of Peter P. and Olave (nee Thorsgaard) Hektoen. Peter Hektoen was a Lutheran parochial school teacher and farmer, and Ludvig's early years were those of a farm boy in a Norwegian community in which English was spoken only in school. At the age of thirteen he entered the Monona Academy in Madison, Wisconsin. The following year he enrolled in Luther College at Decorah, Iowa, where he spent the next six years, graduating with a B.A. degree in 1883. At Luther College he received a general education in Latin, Greek and mathematics, with no training in science. He took advantage of the library facilities and was a member of the debating society, but there was nothing in his course of training which might have been expected to point him toward a medical career. However, about two years before his graduation, during his

vacation periods, he became acquainted with a young Norwegian physician, Johan K. Schreiner, who had entered the practice of medicine in Westby. Presumably Dr. Schreiner was an inspiration to the young college student, for, following graduation, Hektoen spent a year at the University of Wisconsin taking premedical courses in biology, histology and chemistry. Upon completion of this work, he entered the College of Physicians and Surgeons in Chicago.

Medical School and Early Professional Appointments

He began his medical work in the fall of 1885 and received his M.D. degree three years later. It is noteworthy that he was the class valedictorian. He passed the examination for an internship in the Cook County Hospital, winning first place in this competition, and spent the next two years there. At this time he also came under the influence of another physician who did much to mould his professional career. This was Christian Fenger. Following his internship in 1889 he was appointed as pathologist to the Cook County Hospital, a position in which he served until 1903. In 1889 he was also made curator of the museum of Rush Medical College, and, in 1890 physician to the Coroner's Office of Cook County, and Lecturer in Pathology at Rush Medical College. From 1892 to 1894 he was Professor of Pathology at the College of Physicians and Surgeons, returning to Rush Medical College as Professor of Morbid Anatomy in 1895. In these years between 1890 and 1895 he also studied abroad, in Upsala, Prague and Berlin.

Professional Career as a Leader in Medicine

In 1898 Hektoen became Professor of Pathology at Rush Medical College, and in 1901, Professor and Head of the Department of Pathology at the University of Chicago. He served in these two capacities until 1932 and 1933, when he became Professor Emeritus.

During his long professional career Dr. Hektoen revealed an extraordinary array of attributes as a pathologist, medical scientist, writer, teacher and administrator. His leadership in these areas was manifested in many ways. From 1898 to 1902 he

served as President of the Chicago Pathological Society. In 1901 he was President of the American Association of Pathologists and Bacteriologists. Other Presidencies included: Chicago Medical Society, 1919-1921; Society of American Bacteriologists, 1929; American Society of Immunologists, 1927. He was a founder of the Institute of Medicine of Chicago in 1915, and was chairman of its board of governors from 1921 to 1940. He served as chairman of the Division of the Medical Sciences of the National Research Council in 1924, and again in 1926 and 1929. From 1936 to 1938 he was also Chairman of the National Research Council. In the American Medical Association he was chairman of the Section on Pathology and Bacteriology in 1900 and 1901 and was a member of the House of Delegates in 1918 and in 1920. He served the United States Public Health Service from 1934 to 1938 as a member of the National Advisory Health Council, and from 1937 to 1944 as executive director of the National Advisory Cancer Council. In 1930 he became chairman of the Cancer Research Institute of Chicago. He was also one of the founders of the Chicago Tumor Institute, and was president of its board of trustees until 1951.

The following paragraphs, quoted, with a few minor changes, from an article prepared by the writer in an attempt to evaluate the significance of Hektoen's work as a medical scientist, give an indication of his contributions to medical science.

"An evaluation of his scientific career over its more than 60 years of significant contributions to medical science requires an appraisal of its influence both on the development of medical knowledge and on the promotion of human welfare. Fortunately, the task is made less difficult by the fact that his career is represented by a record of sustained achievement seldom equaled. Throughout, it is characterized by a great diversity of interests and a wide range of contributions to medical science and practice. In the record of more than 300 publications one can discern the methods and intellectual traits of an unusual man, many of whose investigations now stand out as landmarks in the history of medicine.

"In attempting to evaluate these publications as a whole it is noteworthy that of the first hundred, ending in 1903 with *An*

Anatomical Study of a Short-Limbed Dwarf, almost all were brief case studies of a type such as any young pathologist might be expected to engage in during his earlier professional years. At this time Hektoen was 40 years of age. One exception is a paper, *The Vascular Changes of Tuberculous Meningitis, Especially the Tuberculous Endarteritis*, embodying material collected during time spent in the laboratory of Chiari. This study was the result of an effort to elucidate the pathogenesis of tuberculous meningitis, and the endarterial changes were interpreted as pointing to the hematogenous origin of the meningitis. Another exception to be noted pertains to his studies of some of the fungal infections, particularly actinomycosis, blastomycosis, and sporotrichosis. Nevertheless, inspection of these first hundred publications affords little evidence of the direction of the path which Hektoen was to tread during the next five decades.

"As already noted, in 1901 he became professor and head of the department of pathology and bacteriology at the University of Chicago, and in the following year, director of the newly formed John McCormick Institute of Infectious Diseases. Soon thereafter his scientific communications began to indicate more clearly his interest in a variety of problems related to the subjects of infection and immunity.

"In this review an attempt will be made to summarize only his more important contributions in the latter field. In doing so, no attempt will be made to enter into a discussion of priorities with respect to any particular subject; rather emphasis will be placed mainly on the significance of these researches in their relationship to the enlarging knowledge of immunology and infectious diseases.

"It was between the years 1903 and 1937, in particular, that his most important investigations were carried on. Prominent in all of them, in one way or another, is the problem of antibodies. During this period his active mind led him into many aspects of immune-body reactions, including their nature, sites of formation, modes of action, especially in the animal body, and their usefulness as tools for the elucidation of many perplexing problems of biology and medicine. As early as 1907, for ex-

ample, we find him concerned with the phenomena of isoagglutination and blood-group reactions. At that time he pointed out that 'the common occurrence of isoagglutinins in human serum suggests that under certain special conditions homologous transfusions might prove dangerous by leading to erythrocytic agglutination within the vessels of the subject transfused.' In the present age of blood banks and blood-typing routines it is interesting to note his emphasis on the need for proper blood typing and his cautious acceptance of the seemingly practical possibilities of the new procedure of blood transfusions! Soon his name became more and more associated with the subject of antibody mechanisms, and by 1910 he was asked to give a Harvey Lecture. This he did, discussing the question of *The Formation and Fate of Antibodies*.

"In those early years, just as now, there was much confusion concerning the nature of antibody action. However, there can be no doubt that some of this confusion was lessened materially by Hektoen and his associates. For example, by 1910 he had pointed out the necessity of considering the 'antibody curve' as a whole in any study of antibody action, and he had warned against the fallacy of drawing conclusions from a single point on this curve. Even today failure to follow this basic principle continues to add confusion to the immunological literature. It is noteworthy, also, that Hektoen regarded the antibody curve as an indication of 'the balance between production and loss of antibody,' thus evidencing his appreciation of the dynamics of antibody action. By this time he had also become interested in the fact that 'in animals previously subjected to the action of a certain antigen the mechanism of antibody production may be especially sensitive to that antigen and respond to proper doses more promptly and freely than is the case in fresh animals.' This will be alluded to in more detail later. His work with Carlson demonstrated that antigen injected intravenously into dogs is removed from the blood within from 3 to 48 hours, thus indicating that antibodies are produced outside the blood circulation, and that blood itself does not 'fix' antigen. He also found that splenectomy just before or just after injection of antigen led to a lower but otherwise

typical antibody curve. Later he studied the question of sites of antibody formation by the ablation of different organs prior to or coincident with antigenic stimulation and found that removal of the stomach, the small intestine, or the thyroid gland caused no interference with antibody formation, nor did adrenalectomy or removal of one-half of the liver. From these and other studies he concluded that 'the mechanisms for the fabrication of antibodies are quite secure from certain disturbances, and they are in no way contradictory of the current view that these mechanisms are located in the blood-forming organs.'

"Between the years 1915 and 1922 appeared his important studies dealing with the effects of leucotoxic agents on antibody formation, including x-rays, thorium x, radium emanation, benzene, toluene, and mustard gas. These studies later proved to be especially valuable following the development of the atomic bomb, and in relation to current investigations of radiation injury. In them he observed a marked reduction in output of antibodies after x-radiation provided that the raying was done several days before the injection of antigen and that it was continued during the period of antibody production. He correlated these findings with the observed facts of a greatly reduced volume of splenic, lymphatic, and thymic tissue, together with changes in the bone marrow, and concluded that his observations harmonized with the view that antibodies are produced in the spleen, the lymphatic tissues, and the bone marrow. He remarked that 'the results indicate also that one reason why the lymphocyte appears to be an important agent of defense in tuberculosis and other conditions may be its power to form antibodies.' Such chemicals as benzene, toluene, and mustard gas also gave a reduction in the production of certain antibodies, associated with grave lesions in the bone marrow and with leucopenia.

"In 1917 he recorded a puzzling observation under the title *Precipitin-Production in Allergic Rabbits*. While attempting to produce precipitins to horse protein in rabbits he observed that 'the introduction of horse blood or serum in rabbits treated a considerable time previously with sheep blood resulted in the

production not only of precipitin for horse protein, but also for sheep protein, as well as for proteins of several other species.' As he emphasized, 'the particular point on which special stress is placed now is the capacity of the rabbit under suitable conditions . . . to elaborate different precipitins at the same time. It appears that the precipitin-production induced in the usual way leaves behind it an increased power of further production so that large amounts of major as well as group and minor precipitins are elaborated on the injection of a new serum or blood. Manifestly the phenomenon is an expression of an increased reactivity and may be classed with other manifestations of allergy.' This independent observation of what is now known as the anamnestic reaction, aside from its theoretical interest, was seen, also, in its practical implications when he suggested that the reappearance of typhoid agglutinins under the stimulation of other infections could be expected to nullify the significance of the Widal test as a method for the diagnosis of typhoid. He thought of this phenomenon as a 'reawakening' of a latent capacity to elaborate specific antibody and pointed to the hazards of such an effect in medicolegal work unless fresh rabbits were used in each instance. Later, with Boor and others, he demonstrated that rabbits receiving simultaneous injections of 35 purified proteins fabricated specific antibodies simultaneously for at least 34 of the 35 antigens injected. Furthermore, when rabbits were immunized against many antigens, the injection later of one of the antigens usually caused the precipitin for that antigen alone to disappear from the blood, indicating that in the rabbit 'different precipitins exist as separate entities.' He also showed in rabbits in which multiple precipitins had been formed after multiple injections of antigen that at a time when they were no longer demonstrable in the blood many might reappear on the injection of only one of the antigens previously injected.

"Hektoen does not seem to have been especially interested in methods, and in much of his work he utilized only the conventional antigen-dilution variety of precipitin test. Today this method is looked on as essentially semiquantitative; indeed, by some, it is regarded as an outmoded serological procedure.

Nevertheless, it is remarkable how many complex aspects of immunology he was able to clarify by intelligently applying this comparatively simple method to the solution of specific problems. With it, for example, Hektoen studied such problems as the antigenic components of hemoglobin, of lens protein, of semen, Bence Jones protein, serum proteins, extracts of various animal parasites, thyroglobulin, fibrinogen, egg white, muscle hemoglobin, etc. He was a firm believer in the view advanced by Osborne and Wells of the importance in immunological research of employing purified proteins whenever possible. Associated with him in these studies should be mentioned in particular Welker, Cole, Schulhoff, Whipple, and Robschey-Robbins. In the studies of lens protein he found a consistent organ-specificness for different species, as he found also in his studies of mammalian thyroglobulins, fibrinogen, and casein. In contrast he observed that solutions of skeletal muscle from the dog were precipitinogenically distinct from those of hemoglobin from dog blood. Of medicolegal significance was his finding that precipitins to human seminal proteins were specific and that this method, therefore, was valuable for the detection of suspected seminal spots and stains, as was the precipitin test for hemoglobin a specific test for blood only. With Welker he concluded that precipitins for several of the blood proteins were individually as well as species distinct, that each protein exists as an independent antigenic unit in the blood or serum and that its antigenic individuality is not the artificial product of the process of separation. With Cole he found that egg white contains five distinct antigens, one of which, conalbumin, was immunologically identical with blood albumin.

"Despite his lack of concern for methodology as such, it is important to note that the method developed by Hektoen and Welker for the sustained production of antibodies has been widely used since it was published in 1933. At that time Hektoen was 70 years of age. This method consisted in the antigen's being adsorbed to aluminum hydroxide prior to its intramuscular injection. They reported that 'in rabbits a single intramuscular injection of aluminum hydroxide carrying a measured quantity of antigen may induce continuous formation

of precipitin for many months' and that 'antigens adsorbed on aluminum hydroxide do not separate on standing and retain their precipitinogenic properties for at least 12 months and probably much longer.' By this method it was shown that at least 10 distinct specific antigens may be adsorbed at the same time and such an injected gel will engender the production of 10 specific antibodies.

"Besides his continuing interest in basic problems of immunology, Hektoen was also interested in the pathogenesis of measles, and as early as 1905 he had produced the disease experimentally in human subjects by the subcutaneous injection of blood from a measles patient, thus demonstrating that the virus may be in the blood at least during the first 30 hours of the rash. In 1911, with Eggers, he also reported the production of measles in rhesus monkeys by injection of citrated measles blood. He maintained a keen interest, also, in the problem of scarlet fever, and contributed to the studies of Tunncliffe, and of George F. and Gladys Henry Dick, in their significant contributions to the better understanding, control, and treatment of this disease. He was also a pioneer contributor to our knowledge of coronary thrombosis and performed the necropsy on a patient reported on by Herrick in 1912. In this patient Hektoen described the presence of a red thrombus which had completely occluded the sclerotic left coronary artery, accompanied by severe myocardial infarction and a nonbacterial fibrinous pericarditis."

Career as a Medical Writer and Editor

In addition to his activities as a pathologist and medical scientist Hektoen early demonstrated unusual abilities as a medical writer and editor. His clarity and conciseness of style, coupled with a meticulous accuracy, soon brought to him increasing duties in this field. In 1904 he became editor of the *Journal of Infectious Diseases*, serving in this capacity until 1941. In 1926 he also became editor of the *Archives of Pathology*, and performed the exacting duties of this assignment until 1950. For many years he edited both the *Transactions of the Chicago Pathological Society* and the *Proceedings of the*

Institute of Medicine of Chicago. For over forty years he also served as editorial writer for the *Journal of the American Medical Association*. In 1894 he wrote a book on Postmortem Technique, and in 1902 he was coeditor of the American Textbook of Pathology. In 1927 he wrote the Introduction to the Study of Infectious Diseases for the third edition of *Modern Medicine: Its Theory and Practice*, by W. Osler and T. McCrae. He also edited Dürck's *Pathological Histology* (1904), *Contributions to Medical Science* (H. T. Ricketts) 1911, and the *Collected Works of Christian Fenger* (1913). With Miss Ella Salmonsens of the John Crerar Library he was co-compiler of the *Bibliography of Infantile Paralysis* (1789-1944). This was published in 1946.

Honors and Lectureships

He received many honors, including eight honorary degrees. These were:

M.D.	Christiania University, Norway	1911
Sc.D.	University of Michigan	1913
Sc.D.	University of Wisconsin	1916
LL.D.	University of Cincinnati	1920
LL.D.	Western Reserve University	1929
LL.D.	Luther College	1936
Sc.D.	University of Illinois	1940
LL.D.	University of Chicago	1940

In 1918 he was elected to the National Academy of Sciences; in 1929 he was given the Order of St. Olaf by the Norwegian Government; in 1941, the Centennial Award of the Wisconsin State Medical Society; and in 1942 the Distinguished Service Medal by the American Medical Association. In this year he was also presented with the Gold-Headed Cane by the American Association of Pathologists and Bacteriologists. In 1949 he was given the Ricketts Award by the University of Chicago.

He was honored with numerous lectureships, including the Harvey and Herter Lectures in New York City, the Cutter Lecture in Boston, the Harrington Lecture in Buffalo, and the Pasteur and Fenger Lectures in Chicago.

He was an honorary member of the following organizations:

Philadelphia Pathological Society
Academy of Medicine of Washington, D.C.
Norwegian Academy of Science
Norwegian Pathological Society
Norwegian Medical Society
Swedish Medical Society
American Society of Clinical Pathologists
New York Pathological Society
College of American Pathologists

The John McCormick Institute For Infectious Diseases

In 1902 Hektoen became Director of the John McCormick Institute for Infectious Diseases. This Institute was established on January 2 of that year by Harold Fowler McCormick and Edith Rockefeller McCormick in memory of their son, John, who had died of scarlet fever. It was developed "for the study and treatment of scarlet fever and other acute infectious diseases and the investigation of allied problems," with the further objective of advancing the "knowledge of infectious diseases in order to improve the methods of prevention and cure and also to care for patients suffering from certain common, acute, infectious diseases." To this end the Durand Hospital was also added. It is perhaps an indication of Dr. Hektoen's administrative acumen that, in describing the work to be carried on, he noted that "persons who give promise of making good use of the opportunity may be appointed as volunteer workers. Ordinarily, regular full-time appointments on the staff with stipend are made only as vacancies occur." In the Institute and the Durand Hospital was carried on the work of Doctors George F. Dick and Gladys Henry Dick which did so much to elucidate the cause of scarlet fever. Moreover, here they also developed the Dick test to determine susceptibility to this disease, a method of immunization against it, and an antitoxin for its treatment. In the Institute worked, as students, many men and women who received inspiration and training from Hektoen and who made important contributions to medical science. A partial list of these workers is given in Fishbein's tribute to Dr. Hektoen. It

was a sad blow to Dr. Hektoen when, due to financial reverses starting in 1929, the Institute and the Durand Hospital had to be closed in 1939. Fortunately, both buildings are now actively functioning as the Hektoen Memorial Institute of the Cook County Hospital, and in them is an active group of investigators engaged in medical research.

Family, Personal Attributes and Avocations

On July 7, 1891, in Habo, Sweden, Dr. Hektoen married Ellen Strandh. The two children of this union, Aikyn, a daughter, and a son, Josef Ludvig, died tragically. Dr. Herrick, in reference to this said that Hektoen "was outwardly well poised and bore with astonishing stoicism the burdens of ordinary trouble. Only once . . . and this was when he referred to many tragic sorrows that had afflicted his family . . . did I hear his voice break and see him wipe the tear in his eye." Fishbein also said that he "withstood a buffeting in his personal life . . . such as has been the lot of but few men . . . (particularly the) tragedy in the death of his daughter and her children. . . . He met these tribulations with courage and with increased labor in his chosen fields."

Many of the personal qualities which endeared Dr. Hektoen to his friends and students have been alluded to in the tributes to him given by Morris Fishbein, James B. Herrick, Ernest E. Irons and H. Gideon Wells. The latter remarked that Hektoen as a teacher encouraged individuality, never trying to mould his students to a pattern or to impose his pattern upon them. On the contrary, he endeavored to have them develop their strongest and best qualities. With regard to his own associations with Dr. Hektoen, Wells said that "in the forty-two years of our relationship I have been to Hektoen innumerable times for aid or consolation, and never once have I failed to get the needed suggestion and encouragement, and always the advice has been wise, often with kindly salutary hints, so veiled as to carry the meaning without hurt." The others refer to his personal attributes in such terms as enthusiasm for medical reform, honesty and scientific accuracy, originality as an investigator, industry and indefatigability, modesty and idealism, kindness of spirit,

inexhaustible patience, generosity, respect for history and tradition, systematic and orderly habits, conciseness, and keen sense of humor. These tributes become all the more meaningful in view of the tragedies already alluded to, as well as the severe financial reverses which forced the closing of the McCormick Institute. Through it all, however, he reacted with courage and equanimity and refused to become embittered. As Fishbein said, he was "the possessor of a calm gentility."

With so many obligations forcing themselves upon him, it is not surprising that he did not have much time for play or hobbies. He liked to read good books, and he evidently enjoyed some card games. Professor Anton J. Carlson tells of a trip home from the International Congress of Physiology, held in Stockholm in 1927, when he and Professor Wiggers played whist every day with Dr. and Mrs. Hektoen at one-tenth of a Swedish öre a point. When they landed in New York City, Carlson collected seven cents from the Hektoens. Dr. Hektoen also enjoyed golf. According to Fishbein, "I have never seen him manifest pride except after sinking an unusually long putt. I have never seen him inconsistent except in the difference between his golf drive when practicing and the motions that he uses when he actually hits the ball. These are sins that may well be pardoned."

His sense of orderliness is illustrated by his advice to laboratory workers that the laboratory should look as if no work is going on there. He also once said that a young investigator must be especially careful lest he find what he is looking for. His conciseness of expression and his sense of humor are seen in his reply to the gushy lady at the dinner party who said to him: "Dr. Hektoen, what important observations have you made this year?" His laconic answer was, "The skirts are shorter." As a young man his sense of humor included a preference for practical jokes, but, as Fishbein notes, these were invariably kindly.

Miscellaneous Activities

Finally, mention should be made of a few miscellaneous activities indicating Hektoen's further diversity of interests. For ex-

ample, as early as 1900 he was consulted frequently on medico-legal matters and soon enjoyed a considerable reputation as an expert in this field. His effectiveness was added to by the fact that while on the witness stand he was not afraid to say, "I do not know." In 1931 he was vice-president of the Chicago Academy of Criminology. In 1907 he was vice-president of Section K of the American Association for the Advancement of Science and in 1929, vice-president of Section N. For many years he was Chairman of the Committee on Scientific Research of the American Medical Association as well as Chairman of the Committee for the Scientific Exhibits. From 1908 to 1910 he was a member of the Illinois Committee to Investigate Diseases of Occupation. He also served for many years as a member of the Board of Directors of the Sprague Memorial Institute, the Chicago Institute of Psychoanalysis, the Elizabeth McCormick Fund, and the Board of Directors of the American Society for the Control of Cancer. During his later years he was active in the development of the John Crerar Library of Chicago and the Museum of Science and Industry.

Acknowledgements

The writing of this memoir was greatly facilitated because of the availability of the splendid biography written by Morris Fishbein commemorating Dr. Hektoen's seventy-fifth birthday. I have brought the bibliography up to date and have rearranged it by years. I have also drawn freely from the articles by Dr. James B. Herrick and Dr. James P. Simonds.

Although it is probable that some phases of Dr. Hektoen's active life have been omitted or inadequately evaluated, it is hoped that the facts here brought together may serve as a reminder of the many contributions made to pathology, to medicine and to human welfare by a man whose long life was characterized by beneficent actions and who was esteemed as a wise physician, a kindly counselor and an honored citizen.

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KEY TO ABBREVIATIONS USED IN BIBLIOGRAPHY

- Am. J. Dis. Child. = American Journal of Diseases of Children
 Am. J. Insan. = American Journal of Insanity
 Am. J. M. Sc. = American Journal of Medical Sciences
 Am. J. Obst. = American Journal of Obstetrics
 Am. J. Ophth. = American Journal of Ophthalmology
 Am. J. Physiol. = American Journal of Physiology
 Am. J. Pub. Health = American Journal of Public Health
 Arch. Path. = Archives of Pathology
 Biochem. J. = Biochemical Journal
 Biochem. Zeits. = Biochemische Zeitschrift
 Boston M. & S. J. = Boston Medical and Surgical Journal
 Boston Soc. M. Sc. = Boston Society of Medical Science
 Brit. J. Dermat. = British Journal of Dermatology
 Brit. M. J. = British Medical Journal
 Buffalo M. J. = Buffalo Medical Journal
 Bull. Alumni Assoc. Rush M. Coll. = Bulletin of the Alumni Association of Rush Medical College
 Bull. Am. Soc. Control Cancer = Bulletin of the American Society for the Control of Cancer
 Bull. Chicago M. Soc. = Bulletin of the Chicago Medical Society
 Bull. Soc. M. Hist. Chicago = Bulletin of the Society of Medical History of Chicago
 Centralbl. f. allg. Path. u. path. Anat. = Zentralblatt für allgemeine Pathologie und pathologische Anatomie
 Centralbl. f. Bakt. = Zentralblatt für Bakteriologie
 Chicago Clin. Rev. = Chicago Clinical Review
 Chicago M. Rec. = Chicago Medical Recorder
 Ill. Health News = Illinois Health News
 Ill. M. J. = Illinois Medical Journal
 Ind. M. J. = Indiana Medical Journal
 Internat. Clin. = International Clinics
 Internat. M. Mag. = International Medical Magazine
 J. Am. Chem. Soc. = Journal of the American Chemical Society
 J. A. M. A. = Journal of the American Medical Association
 J. Am. Pharm. Assoc. = Journal of the American Pharmaceutical Association
 J. Bact. = Journal of Bacteriology
 J. Exper. M. = Journal of Experimental Medicine
 J. Immunol. = Journal of Immunology
 J. Infect. Dis. = Journal of Infectious Diseases
 J. Lab. Clin. M. = Journal of Laboratory and Clinical Medicine
 J. M. Res. = Journal of Medical Research
 J. Mich. M. Soc. = Journal of the Michigan Medical Society
 J. Nerv. Ment. Dis. = Journal of Nervous and Mental Diseases

- J. Path. Bact. = Journal of Pathology and Bacteriology
 J. Prev. M. = Journal of Preventive Medicine
 M. News = Medical News
 M. Sent. = Medical Sentinel
 M. & S. Rep. Cook Co. Hosp. = Medical and Surgical Report of Cook County Hospital
 Minn. M. = Minnesota Medicine
 Nat. Bull. Am. Soc. Control Cancer = National Bulletin of the American Society for the Control of Cancer
 New Eng. J. M. = New England Journal of Medicine
 N. Y. M. J. = New York Medical Journal
 N. Am. Pract. = North American Practitioner
 Phila. M. J. = Philadelphia Medical Journal
 Phila. Mo. M. J. = Philadelphia Monthly Medical Journal
 Proc. Am. Sc. Cong. = Proceedings of the American Scientific Congress
 Proc. Ann. Cong. M. Ed. = Proceedings of the Annual Congress on Medical Education
 Proc. Inst. M. Chicago = Proceedings of the Institute of Medicine of Chicago
 Proc. Nat. Acad. Sc. = Proceedings of the National Academy of Sciences
 Proc. Soc. Exp. Biol. M. = Proceedings of the Society for Experimental Biology and Medicine
 Progr. M. = Progressive Medicine
 Pub. Health Mich. = Public Health of Michigan
 Quart. Bull. N.W. Univ. M. School = Quarterly Bulletin of the Northwestern University Medical School
 Studies & Rec. Norwegian-Am. Hist. Assoc. = Studies and Records of the Norwegian-American Historical Association
 Tr. Assoc. Am. Phys. = Transactions of the Association of American Physicians
 Tr. Chicago Path. Soc. = Transactions of the Chicago Pathological Society
 Tr. Cong. Am. Phys. Surg. = Transactions of the Congress of American Physicians and Surgeons
 Tr. Minn. Path. Soc. = Transactions of the Minnesota Pathological Society
 Tr. Sec. Path. Physiol. A.M.A. = Transactions, Section of Pathology and Physiology of the American Medical Association
 Univ. Chicago Mag. = University of Chicago Magazine
 Virchow's Arch. f. path. Anat. = Virchow's Archiv für pathologische anatomie und physiologie und klinische medizin
 West. Clin. Rec. = Western Clinical Recorder
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